the square root of the difference in temperature. This tends to give an angular direction to currents.

The open-hearth furnace works very close to the yield point of the refractories, but it is only recently that water-cooling has been adopted for these furnaces, although it has been used for years in the blast furnace. Water-cooling adds to the life of the brickwork by increasing the thermal gradient through the wall and removing the heat. It adds little if anything to the fuel consumption and increases the life of certain portions of the furnace, thereby reducing the amount of time the furnace is down for local repairs. This means increasing the output. Water-cooled doors and frames were used a number of years ago, but the extended use of cooling devices is rather recent.

In early designs of furnaces the regenerator chambers were under the furnace and the uptakes rose direct to the ports. As a result the upper portion of the checkerwork blocked up rapidly and its life was reduced. The first -cinder pockets were small chambers parallel with the regenerator chamber designed to distribute the gases to the checkerwork by a number of small ports and their functioning as cinder pockets was accidental.
The way the cinder lodged in them showed the advantage of increasing their size, and ample space for this purpose became available when the checkerwork was removed from below the furnace and placed under the charging platform. The main fault with many of these pockets is their lack of depth. Removable cinder pockets have been devised.

Regenerative methods of firing or the preheating of the incoming gases and the air-for combustion have made it possible to attain high furnace temperatures. The numerous furnaces utilizing the heat of the products of combustion for the preheating of the gas and air supply are a grand memorial to the Siemens

brothers.

In the designing of any furnace with regenerators it is important to have sufficient regenerator capacity and equally important to avoid overdoing the matter. The products of combustion leave the heating chamber of open-hearth furnaces at a temperature of about 1700°. The incoming air enters the valve at 10° &nd the temperature of the producer gas in the main will range from 500° to 600°. Coke oven gas, natural gas or any gaseous fuel containing hydrocarbons cannot be passed through a regenerator

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